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Natural Resources Conservation Service

Pullman Plant Materials Center Progress Report of Activities - 2003

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Who We Are

The NRCS Plant Materials Program develops cost effective vegetative solutions for soil and water conservation problems. The Program consists of 26 plant materials centers (PMC), which receive financial and/or technical assistance from the NRCS. The Pullman Plant Material Center lies in the heart of the Palouse Hills region of Eastern Washington; an area that is internationally recognized for its outstanding wheat yields.

Geum triflorum is one of the Palouse Prairie native flowers under study at the Pullman PMC. Photo by D. Skinner

Soil and Water Issues of Washington & Oregon East of the Cascades

Many of the soils in this region are loess deposits that are very susceptible to wind and water erosion despite the fact that much of the region receives less than 14 inches of annual precipitation. Dry-land winter wheat farming and irrigated farming in the Columbia Basin are large and important enterprises. Unfortunately, several hundred thousand acres of cropland go into the winter with insufficient cover to protect the soil each year.

Another conservation problem stems from annual weeds that have largely replaced native rangeland vegetation in many areas. Noxious weeds are also invading our forested areas. These undesirable plants greatly impede natural revegetation and threaten wildlife that depend on a healthy environment.

Our riparian areas frequently lack desirable vegetation. Establishing desirable trees and shrubs is important to shade and provide woody debris in our salmon and steelhead bearing streams. Weedy species such as reed canarygrass and Russian-olive hinder this process.

We have featured a few of our many studies in the *Progress Report of Activities – 2003*, and we hope they give a glimpse of our efforts at the Pullman PMC.

Objectives

In order to combat the ever-changing environmental problems that the Palouse and surrounding regions face, the Pullman PMC is currently conducting the following projects:

- Developing technology and plant material that are appropriate for conservation buffers
- Developing native plants that provide wildlife habitat and restore stream banks and other natural areas
- Developing techniques to enhance stands of desirable plants

Blue Wildryes for Eastern Washington and Oregon

Blue wildrye is an important soil-stabilizing grass that grows in the mountains and moist prairies of the Pacific Northwest. This tall, wide-leafed grass establishes quickly and frequently is among the first plants to occupy slopes following catastrophic fires. Initial research at the PMC indicates that blue wildrye is a better short-lived grass for restoration plantings than mountain brome because it is not as competitive with the late-seral species.

The Pullman PMC is in the process of increasing the seed of two blue wildrye ecotypes. One originates from Whitman County and the other originates from the Little Nachez River drainage. The Whitman County ecotype was collected on a remnant Palouse Prairie hillside along Union Flat Creek. The plants are very robust and produce copious amounts of large seeds. The seedlings are vigorous and disease incidence has been very low. We hope to have a few hundred pounds of seed produced in 2004 and then proceed with preparing documentation for an official release.

The second ecotype in production at the Pullman PMC originates from a high, open slope in the Little Nachez River drainage in the Wenatchee National Forest. It was one of 225 separate populations evaluated at the PMC several years ago. The Little Nachez ecotype, (Accession No. 9033968) consistently displayed superior freedom of disease, large basal area, high seed production, and high vigor. Seed production of 9033968 is occurring at the Pullman PMC but it will be a few years before enough is on hand for a release.

Canada Milkvetch Development

Seventy-seven populations of native *Astragalus*, *Hedysarum*, *Lathyrus, Lotus*, *Lupinus*, *Petalostomon, Psoralea*, *Thermposis, Trifolium*, and *Vicia* species were evaluated at Lind, Washington. Among these is an outstanding population of Canada milkvetch (*Astragalus canadensis*) that originates from a rangeland site in Lake County, Oregon. This population (Accession No. 9033982) performed exceptionally well during the 4-year evaluation period in which annual precipitation ranged from 6.7 to 10.1-inches.

Canada milkvetch occurs in every region of North America with the exception of the extreme southeast and southwest United States. The 9033982 accession is rhizomatous, perennial, and well adapted to droughty, upland sites. It grows to 3-feet high, produces an abundance of long leaves, and flowers in early to late summer. Cylindrical, brown seed pods appear in mid-summer and unlike many native legumes, the pods of 9033982 exhibit a lower tendency to shatter.

Two types of seed are produced by each plant; small-dark seed and a large-gold seed. The small-dark seed has far lower germination levels than the large gold seed, and both types exhibit seed dormancy that can be overcome by scarification or cold-moist stratification. Scarified seed germinates rapidly and some germinate as fast as 24 hours. Efforts are underway to determine if fall-dormant seeding might result in acceptable stand establishment.

Six *Rhizobium* inoculums were compared at the Pullman PMC and the most effective type was intended for birdsfoot trefoil. The inoculant intended for *Astragalus* species was less effective.

Seed pod of Canada Milkvetch

Flowers bloom in late June

Evergreens for Windbreaks in the 9-12” Precipitation Zone

Windbreaks protect the soil from wind erosion, provide wildlife habitat, improve living conditions in the dryland cropping areas, and control drifting snow. The Pullman PMC acquired trees of Siberian larch, Rocky Mountain juniper, and Scotch pine, and established 3 windbreak plantings in Adams County in 1996. The Siberian larch is test material acquired from the North Dakota PMC. It is similar to western larch in that it losses its needles every winter. The Rocky Mountain juniper is stock developed under the MITOSIS program in Montana. The Scotch pine was purchased at a local nursery for comparison.

Survival and dimensional data have been taken on each tree. Rocky Mountain juniper, while not the tallest, has consistently had the best survival. Siberian larch has had the poorest survival.

Planting	**Rocky Mountain Juniper**		**Scotch Pine**		**Siberian Larch**	
Location	Ave. ht	Survival	Ave. ht	Survival	Ave. ht	Survival
Smith	7.6 ft	100%	10.8 ft	90%	6.5 ft	50%
Schillinger	5.9 ft	96	11.7	100	3.8 ft	40%
Snyder	6.6 ft	98	n/a	n/a	n/a	n/a

Rocky Mountain Juniper

Scotch Pine

Determination of Factors Important for CRP Sagebrush Plantings

The Conservation Reserve Program in Washington State allowed producers to either seed or transplant live shrubs into their bid acres. Many producers opted for the transplants and several million sagebrush plants were transplanted in the drier regions of Washington. The plantings occurred during periods when temperatures were low and evaporative losses were minimal. Unfortunately, survival has been sporadic. The Pullman Plant Materials Center investigated this issue and determined factors associated with poor survival.

CRP sagebrush plantings in Adams and Franklin Counties were visited in late-spring 2003. Sage plants were counted and compared to what a full stand should number. NRCS Conservation notes in the contracts were used to determine planting dates, supplier, and who installed the planting. Soils data were compiled from soil surveys and weather data were compiled from Washington weather station reports. Data were analyzed using regression, Principal Component Analysis, and ANOVA statistical methods.

The overall survival of all the plantings evaluated was 64%. Eight out of 90 sites were complete failures. Twenty-one out of the 90 sites were complete successes (100% survival).

Competing vegetation was the most important survival component of all the factors analyzed. Mean survival varied from 39, 74, and 90% for High, Medium, and Light competition, respectively. Competing vegetation was categorized as High, Medium, or Light.

High competition consisted of either very dense stands of cheatgrass, fiddleneck, or aged CRP grasses with dense cheatgrass understory. Weed control was also nonexistent.

Medium competition consisted of 1-2 plants/sq. ft of established CRP grasses. Cheatgrass was largely absent. Weed control consisted of minimal scalping.

Light competition consisted of either newly seeded CRP cover or total weed control around each plant.

Precipitation received 120 prior to- and 120 post-planting varied from 3.72 to 10.26-inches. As expected, survival was poorest at 3.72-inches of 240-day precipitation. However, survival was not greatest at the highest precipitation and was attributed to a concurrent increase in competing vegetation.

Planting date was a significant survival factor (P< .001). The December and February plantings fared very well with better then 79% of the plants surviving. The March and November plantings performed poorly. The November plantings opened the soil around the sagebrush plants and this area was quickly filled with dense stands of cheatgrass. The March plantings were largely made into soil where cheatgrass had already capitalized on the surface moisture.

The Pullman PMC now recommends larger plugs (10 cubic inch root systems) should be considered for future plantings because they would have more root mass. Second, better control of competing vegetation must be exercised. Third, March planting should be discouraged because much of the upper soil moisture will be depleted. Lastly, fall plowing narrow strips would be a good site preparation practice because competition would be reduced and the dark soil surface would warm sooner in the spring.

Palouse Prairie Restoration Project

The Palouse Prairie, like the tall grass prairies of the Midwest, has been reduced to fragments surrounded by large areas of cropland. Over 75 species have been collected from remnant Palouse Prairie stands. Among them are:

Achillea millefolium
Agastache urticifolia
Allium acuminatum
Arnica sororia
Asclepias speciosa
Aster jessicae
Aster occidentalis
Astragalus arrectus
Balsamorhiza sagittata
Besseya rubra
Brodiaea douglasii
Camassia quamash
Carex microptera
Castilleja lutescens
Cirsium brevifolium
Clarkia pulchella
Clematis hirsutissima
Collinsia parviflora
Collomia grandiflora
Delphinium nuttallianum
Dodecatheon pulchellum
Elymus glaucus
Epilobium angustifolium
Erigeron corymbosus
Eriogonum heracleoides
Erythronium grandiflora
Festuca idahoensis
Fritillaria pudica
Gaillardia aristata
Galium boreale
Gentiana affinis
Geranium viscosissimum
Geum macrophyllum
Geum triflorum
Haplopappus liatriformis
Helianthella uniflora
Heracleum lanatum
Heuchera cylindrica
Hieracium albertinum
Hydrophyllum fendleri
Iris missouriensis
Koeleria macrantha
Leymus cinereus
Linum lewisii
Lithophragma parviflora
Lithospermum ruderale
Lomatium dissectum
Lomatium grayi
Lomatium macrocarpum
Lomatium triternatum
Lupinus leucophyllus
Lupinus sericeus
Microseris nutans
Microsteris gracilis
Penstemon confertus
Penstemon deustus
Perideridia gairdneri
Phacelia heterophylla
Phlox speciosa
Poa secunda (Big bluegrass)
Poa secunda (Sandberg bluegrass)
Potentilla arguta
Potentilla gracilis
Pseudoroegneria spicata ssp. *inermis*
Ranunculus glaberrimus
Senecio integerrimus
Senecio serra
Sidalcea oregana
Silene douglasii
Silene spaldingii
Sisyrinchium inflatum
Solidago missouriensis
Spiraea betulifolia
Valeriana edulis
Wyethia amplexicaulis
Zigadenus venenosus

Photos courtesy of D. Skinner


Clarkia pulchella


Brodiaea douglasii


Arnica sororia

Palouse Prairie Restoration Seed Germination Study results:

No stratification required

Achillea millefolium
Agoseris grandiflora
Aster jessicae
Aster occidentalis
Bromus marginatus
Clarkia pulchella
Collomia grandiflora
Elymus glaucus
Festuca idahoensis
Gaillardia aristata
*Galium boreale**
Geum triflorum
Haplopappus liatriformis
Helianthella uniflora
Koeleria macrantha
Linum lewisii
Mimulus guttatus
Phacelia heterophylla
Poa ampla
Poa sandbergii
Pseudoroegneria spicata
*Sidalcea oregana**
Solidago missouriensis

*Stratification may increase germination but some will occur without it.

Cold moist stratification required

Arnica sororia
Epilobium angustifolium
Gentiana affinis
*Heuchera cylindrica**
Penstemon attenuatus
Penstemon deustus
Perideridia gairdneri
Potentilla arguta
Potentilla gracilis

Other

Lupinus sericeus needs hot water scarification
Geranium viscosissimum benefits from scarification

*light may increase germination

Cold moist stratification plus cool growing conditions

Allium acuminatum
Asclepias speciosa
Balsamorhiza sagittata
Besseya rubra
Brodiaea douglasii
Camassia quamash
Delphinium nutallianum
Dodecatheon pulchellum
Erythronium grandiflora
Fritillaria pudica
Heracleum lanatum
Lithophragma parviflora
Lomatium dissectum
Lomatium triternatum
Phlox speciosa
Senecio integerrimus
Sisyrinchium inflatum
Wyethia amplexicaulis
Zigadenus venenosus

For More Information

To obtain seed, plants, or information on conservation uses for PMC plant releases, contact your local NRCS office or us at:

USDA – NRCS
Pullman Plant Materials Center
P.O. Box 646211
Pullman, WA 99164-6211
Phone: (509) 335-7376
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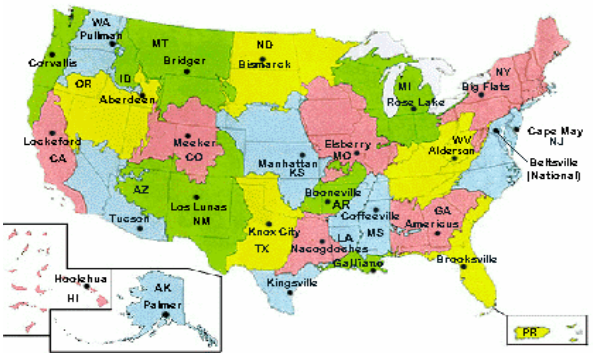

To learn more about these and other PMC activities, visit our website: http://Plant-materials.nrcs.usda.gov.